Science & Technical Support Section's
SciFYI
King County
Department of Natural Resources and Parks
Water and Land Resources Division
A science section digest of current environmental issues in King County
September 2015 Article 1509-6

2015 Annual Science Seminar

King County's Science and Technical Support Section sponsor annual half day Science Seminars. Visiting lecturers and King County employees present recent findings from their environmental monitoring programs.

The 2015 Annual Science Seminar is scheduled for:

Thursday, November 5th,
8th Floor Conference Room at King Street Center.
201 South Jackson Street, Seattle, WA. 98104

The Science Seminars provide an opportunity for sharing relevant and recent information and are open to all interested environmental science professionals and the public.

Please look for upcoming announcements on the 2015 Seminar topics.

For more information on Science Seminars please visit: http://green2.kingcounty.gov/scienceseminars/.

Published by:

King County
Department of Natural Resources and Parks
Water and Land Resources Division
Science and Technical Support Section

Section Manager: Dave White

Newsletter Coordinator: Larry Jones

Editor: Doug Williams

Designers: Laurel Preston, Sandra Kraus

Web Design/Production: Fred Bentler

Available on the Web at:
http://www.kingcounty.gov/environment/wlr/science-section/sci-fyi-newsletter.aspx

Send questions, comments and future story ideas to:

Kate O'Laughlin - kate.olaughlin@kingcounty.gov, 206-477-4789

Jim Simmonds - jim.simmonds@kingcounty.gov, 206-477-4825

File: 1508_4969_SciFYInews.indd skrau

Cooling down streams: addressing warm summer water temperatures in Green River Tributaries

By Andrew Miller and Chris Knutson

There are many ecological benefits to planting trees in riparian areas adjacent to streams and rivers. One of the most important is lowering summer water temperatures which are too high for many aquatic animals. Cool water temperatures are critical for development of salmon and trout, and high temperatures can result in stress and even death. Healthy streamside vegetation provides shade to the channel, blocking solar radiation and reducing the heat reaching the stream.

In spite of this obvious benefit, all streamside planting projects face the question: how much will the trees planted actually affect stream water temperatures? Trying to answer that question is complicated. Vegetation planted adjacent to streams can take decades to fully mature, so direct measurement of its effect on stream temperatures is not practical. However, water quality models can estimate the impact of new vegetation once it reaches maturity. After a series of riparian plantings were completed on Newaukum Creek (**Figure 1**), King County scientists applied water quality models to calculate the increase in effective shade and the associated decreases in solar heat loads and maximum water temperature during critical summer conditions.

Model results showed how vegetation increases effective shade and reduces solar heat loads and maximum temperatures (**Figure 2**). Modeled effective shade increased by as much as 58 percent in Newaukum Creek, while the solar heat loads were reduced in planted areas by as much as 61 percent. Modeled water temperature was reduced by as much as 0.9 °C with an average reduction of 0.3 °C in the reach that was planted.

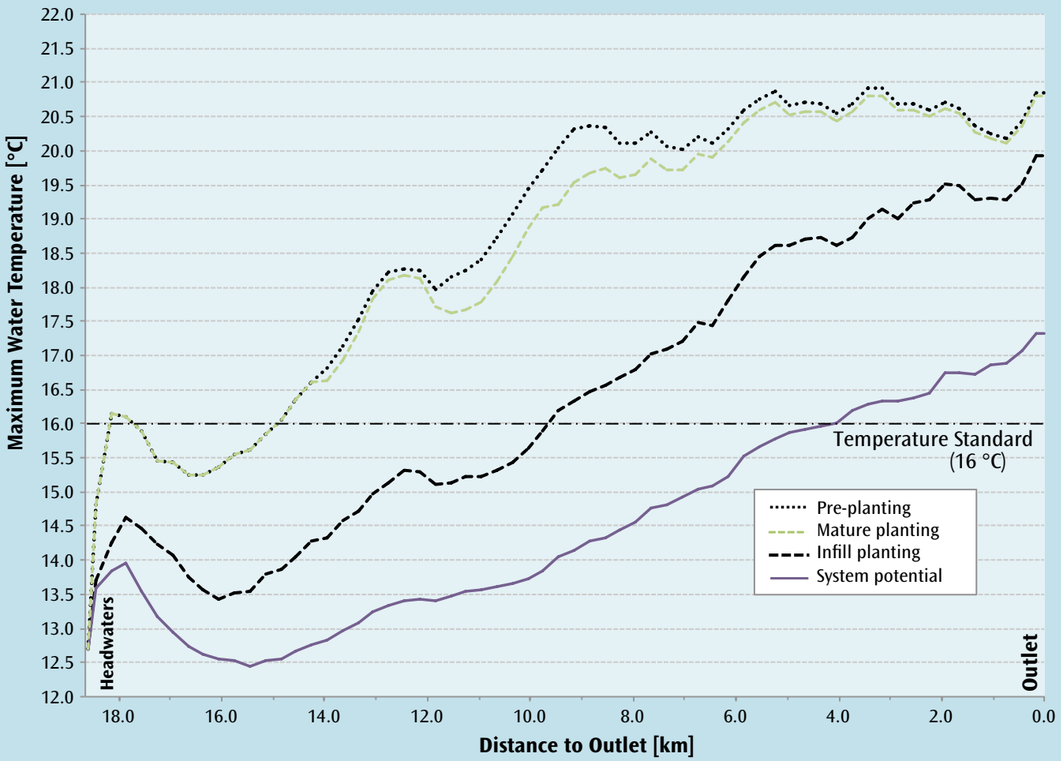

FIGURE 2.
Plot of estimated temperatures along the modeled reach of Newaukum Creek. Each line represents a different planting scenario: the black dotted line (pre-planting) represents conditions prior to the planting on Newaukum Creek in 2012; the green dashed line (mature planting) represents vegetation planted in 2012 reaching maturity; the black dashed line (infill planting) represents a scenario where all unvegetated areas adjacent to Newaukum are planted with small trees that reach maturity; and the solid purple line (system potential) represents a scenario where all areas adjacent to Newaukum Creek being covered in mature coniferous trees.

While such temperature reductions may appear modest, this is likely due to the small area planted; only 1.1 percent of the riparian areas of the modeled reach in Newaukum Creek were planted with trees in 2012. It's also important to consider that many riparian areas of Newaukum Creek are largely devoid of trees in the predominantly agricultural Enumclaw plateau (**Figure 1**). Therefore, much of the benefit from adding trees could be lost downstream as water flows through terrain with that receives full sun.

To demonstrate the additional benefit from continued tree planting, a planting scenario was modeled where all riparian areas with little to no vegetation were replaced with mature trees similar to what was planted in 2012 (infill planting scenario in **Figure 2**). This action resulted in an average temperature reduction of 2.5 °C in the reach affected by planting, and an additional 6.0 km of Newaukum Creek was estimated to meet the Washington State summer temperature standard of 16.0 °C. While other factors also affect temperature, such as stream flow discharge, climate, and groundwater influence, the critical importance of shade in controlling temperature in small streams lends credence to the model's utility for quantifying the potential benefits of riparian planting.

In addition to the shade modeling effort described above, King County took aerial photographs (using a digital photograph through a wide angle lens that allows the sky in all directions to be simultaneously visible) of trees overhanging Newaukum Creek along the replanted reaches

FIGURE 3.
Example of a hemispherical photograph taken from the middle of the stream channel in Newaukum Creek in 2012 and 2014. A computer program is used to calculate the amount of solar radiation reaching the stream through the vegetation overhead.

Contributors to King County's SciFYI

Chris Knutson
Chris is a Water Quality Planner in the King County Science and Technical Support Section. He models surface water quality for planning and has worked on a variety of freshwater related projects including: small lakes volunteer monitoring program, aquatic plant and invasive species issues, microbial source tracking, harmful algal blooms, and various other aquatic monitoring projects. Chris also manages the Science Summer Youth Intern program. He has a BA in Environmental Studies/Planning and Policy from Western Washington University and is the current President of the Washington State Lake Protection Association (WALPA).

Andrew Miller
Andrew joined the King County Science and Technical Support Section in the fall of 2013 as a water quality planner. He supports ongoing monitoring programs that track general river and stream health via measurement and assessment of stream flow and in-stream concentrations of bacteria, nutrients, conventionals, and other parameters. Andrew received his Master's degree in Forest Hydrology from West Virginia University, where he studied the hydrologic impacts of mountaintop removal coal mining.

Published by:

King County
Department of Natural Resources and Parks
Water and Land Resources Division
Science and Technical Support Section

Section Manager: Dave White
Newsletter Coordinator: Larry Jones
Editor: Doug Williams
Designers: Laurel Preston, Sandra Kraus
Web Design/Production: Fred Bentler
Available on the Web at:
http://www.kingcounty.gov/environment/wlr/science-section/sci-fyi-newsletter.aspx

Send questions, comments and future story ideas to:

Kate O'Laughlin - kate.olaughlin@kingcounty.gov, 206-477-4789

Jim Simmonds - jim.simmonds@kingcounty.gov, 206-477-4825

File: 1508_4969_SciFYInews.indd skrau